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Visualizing the growth dynamics of individual single-wall carbon nanotubes

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In order to meet the increasing demand of faster and more flexible electronics and optical devices and at the same time decrease the use of the critical metals, carbon based devices are in fast development. Single walled carbon nanotube (SWCNT) based electronics is a way of addressing the environment friendly approach of faster and better electronics. In order to exploit the potential of SWCNTs in the electronic industry fully, selective growth of either conducting or semiconducting tubes is of high importance.

Understanding the mechanism for growth of SWCNTs is of great importance for maximizing the quality and yield, and for the ability to control structure including chirality. Transmission electron microscopy (TEM) gives unmatched detailed insight of the local chemical and structural state of the nanostructured materials. Adding the possibility of controlling the gaseous atmosphere around the studied sample at elevated temperature gives a unique way of monitoring gas-solid interactions such as CNT growth.

Here we show the direct experimental evidence on the growth dynamics of SWCNTs from Co/MgO catalysts using CO as carbon source inside the environmental TEM. The evolution of the interfacial structure of the catalyst and SWCNT are monitored during CNT growth.